DOCUMENT NUMBER AND REVISION

VL-FS-BTHQ 22008VSS-05 REV. A

(BTHQ 22008VSS-SMN-LED- WHITE (2 DIES) BLUE MODE)

DOCUMENT TITLE:

SPECIFICATION

OF

LCD MODULE TYPE

CUSTOMER	**DATA MODUL**
MODEL NUMBER	**BTHQ 22008VSS-05**
CUSTOMER APPROVAL	
DATE	

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A	2003.03.04	First Release.	PHILIP CHENG	LU MIN YUAN

CONTENTS

Specification
of
LCD Module Type
Model No.: BTHQ 22008VSS-05

1. General Description

- 20 characters (5x8 dots) x 2 lines STN Negative Blue Transmissive Dot Matrix LCD module.
- Viewing Angle: 6 O'clock direction.
- Driving scheme: 1/16 Duty, 1/5 bias.
- 'SAMSUNG' KS0070BP-00CC (Die form) LCD Controller & Driver or equivalent.
- 'SAMSUNG' KS0065B-PCC (Die form) LCD Segment Driver or equivalent.
- White LED05 backlight.

2. Mechanical Specifications

The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

Table 1

Parameter	Specifications	Unit
Outline dimensions	146.0(W) x 43.0(H) x 13.5 MAX.(D)	mm
Effective viewing area	123.0(W) x 23.0(H)	mm
Display format	20 characters x 2 lines	-
Character size	4.840(W) x 9.217(H) (5 x 8 dots)	mm
Character spacing	1.160(W) x 0.536(H)	mm
Character pitch	6.000(W) x 9.753(H)	mm
Dot size	0.956(W) x 1.139(H)	mm
Dot spacing	0.015(W) x 0.015(H)	mm
Dot pitch	0.971(W) x 1.154(H)	mm
Weight:	Approx. 75	grams

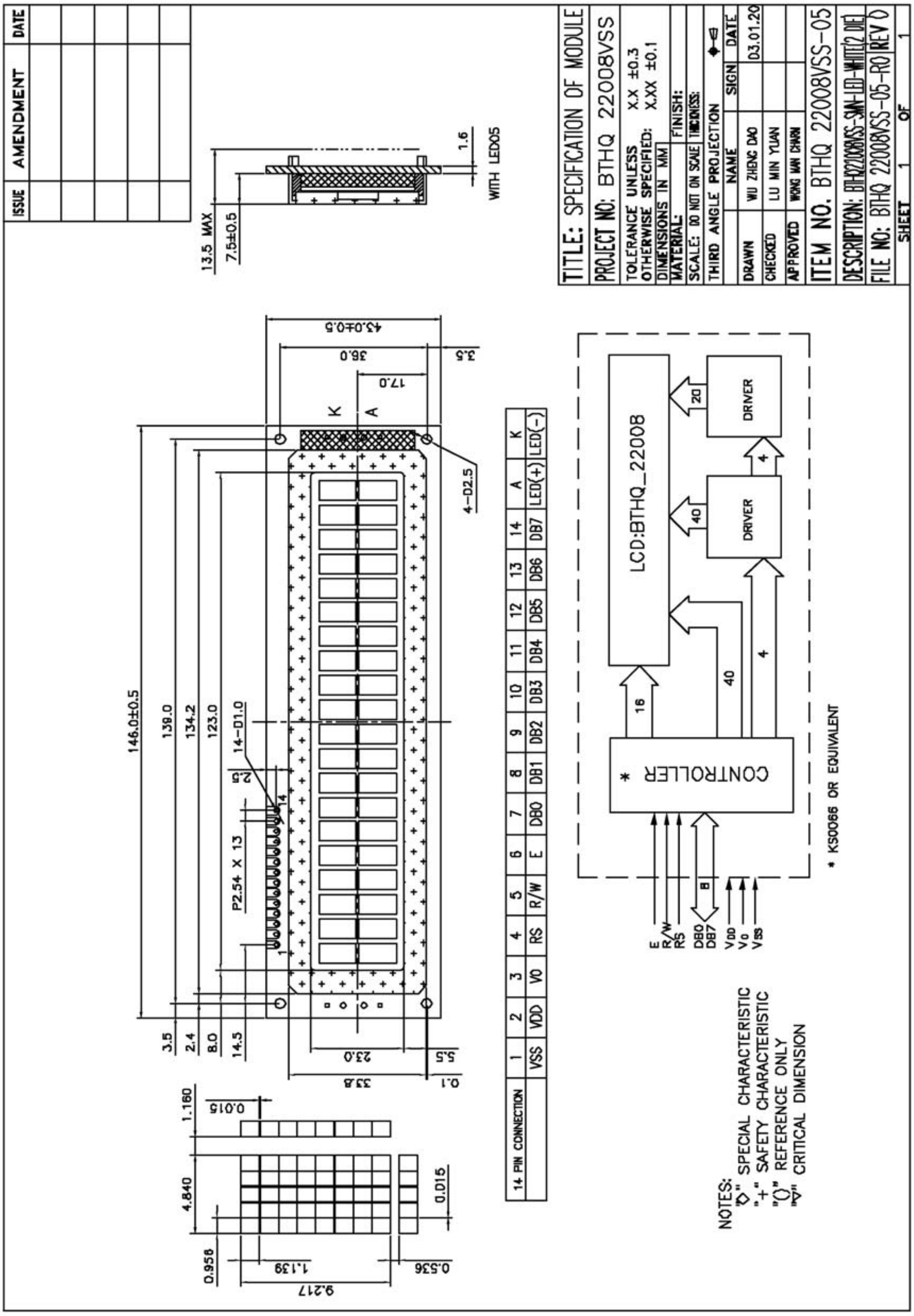


Figure 1: Outline Drawing

3. Interface signals

Table 2

Pin No.	Symbol	Description
1	VSS	Ground(0V).
2	VDD	Power supply for logic (+5V)
3	V0	Power supply for LCD driver
4	RS	Register Select Input: “High” for Data register (for read and write) ”Low” for Instruction register (for write), Busy flag, address counter (for read)
5	R/W	Read/Write signal: ” High” for Read mode. “Low” for Write mode.
6	E	Enable. Start signal for data read /write.
7	DB0	Data input/output (LSB)
8	DB1	Data input/output
9	DB2	Data input/output
10	DB3	Data input/output
11	DB4	Data input/output
12	DB5	Data input/output
13	DB6	Data input/output
14	DB7	Data input/output (MSB)
A	LED(+)	Anode of LED backlight.
K	LED(-)	Cathode of LED backlight.

4. Absolute Maximum Ratings

4.1 Electrical Maximum Ratings(Ta = 25 ºC)

Table 3

Parameter	Symbol	Min.	Max.	Unit
Power Supply voltage (Logic)	VDD - VSS	-0.3	+7.0	V
Power Supply voltage (LCD drive)	VLCD=VDD – V0	-0.3	+15.0	V
Input voltage	Vin	-0.3	VDD +0.3	V

Note:

The modules may be destroyed if they are used beyond the absolute maximum ratings.

All voltage values are referenced to VSS = 0V.

4.2 Environmental Condition

Table 4

Item	Operating Temperature (Topr)		Storage Temperature (Tstg)		Remark
	Min.	Max.	Min.	Max.	
Ambient Temperature	0°C	+50°C	-10°C	+60°C	Dry
Humidity	95% max. RH for Ta ≤ 40°C < 95% RH for Ta > 40°C				no condensation
Vibration (IEC 68-2-6) cells must be mounted on a suitable connector	Frequency: 10 ~ 55 Hz Amplitude: 0.75 mm Duration: 20 cycles in each direction.				3 directions
Shock (IEC 68-2-27) Half-sine pulse shape	Pulse duration : 11 ms Peak acceleration: 981 m/s^2 = 100g Number of shocks : 3 shocks in 3 mutually perpendicular axes.				3 directions

5. Electrical Specifications

5.1 Typical Electrical Characteristics

At Ta = 25 °C, VDD = 5V±5%, VSS=0V.

Table 5

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage (Logic)	VDD-VSS		4.75	5.0	5.25	V
Supply voltage (LCD)	VLCD =VDD-V0	VDD =5.0V, Note1.	4.1	4.4	4.7	V
Input signal voltage for E,DB0-DB7,R/W,RS.	V_{IH}	"H" level	2.2	-	VDD	V
	V_{IL}	" L" level	-0.3	-	0.6	V
Supply Current (Logic & LCD)	IDD	Character mode, Note 1	-	1.4	2.1	mA
		Checker board mode, Note 1	-	1.9	2.9	mA
Supply Current (LCD)	I0	Character mode, Note 1	-	1.0	1.5	mA
		Checker board mode, Note 1	-	1.0	1.5	mA
Supply voltage of white LED05 backlight	VLED	Forward current =40 mA Number of LED dies =1x2 =2.	3.8	4.0	4.2	V

Note (1) : There is tolerance in optimum LCD driving voltage during production and it will be within the specified range.

5.2 Timing Specifications

At Ta = 0 °C To +50 °C , VDD = +5V±5%, VSS = 0V.

Refer to Fig. 2, the bus timing diagram for write mode.

Table 6

Parameter	Symbol	Min.	Max.	Unit	Test pin
E cycle time	t_C	500	-	ns	E
E rise time	t_R	-	25	ns	E
E fall time	t_F	-	25	ns	E
E pulse width (High, Low)	t_W	220	-	ns	E
R/W and RS set-up time	t_{SU1}	40	-	ns	R/W,RS
R/W and RS hold time	t_{H1}	10	-	ns	R/W, RS
Data set-up time	t_{SU2}	60	-	ns	DB0-DB7
Data hold time	t_{H2}	10	-	ns	DB0-DB7

Refer to Fig. 3, the bus timing diagram for read mode .

Table 7

Parameter	Symbol	Min.	Max.	Unit	Test pin
E cycle time	t_C	500	-	ns	E
E rise time	t_R	-	25	ns	E
E fall time	t_F	-	25	ns	E
E pulse width	t_W	220	-	ns	E
R/W and RS set-up time	t_{SU}	40	-	ns	R/W,RS
R/W and RS hold time	t_H	10	-	ns	R/W, RS
Data output delay time	t_D	-	120	ns	DB0-DB7
Data hold time	t_{DH}	20	-	ns	DB0-DB7

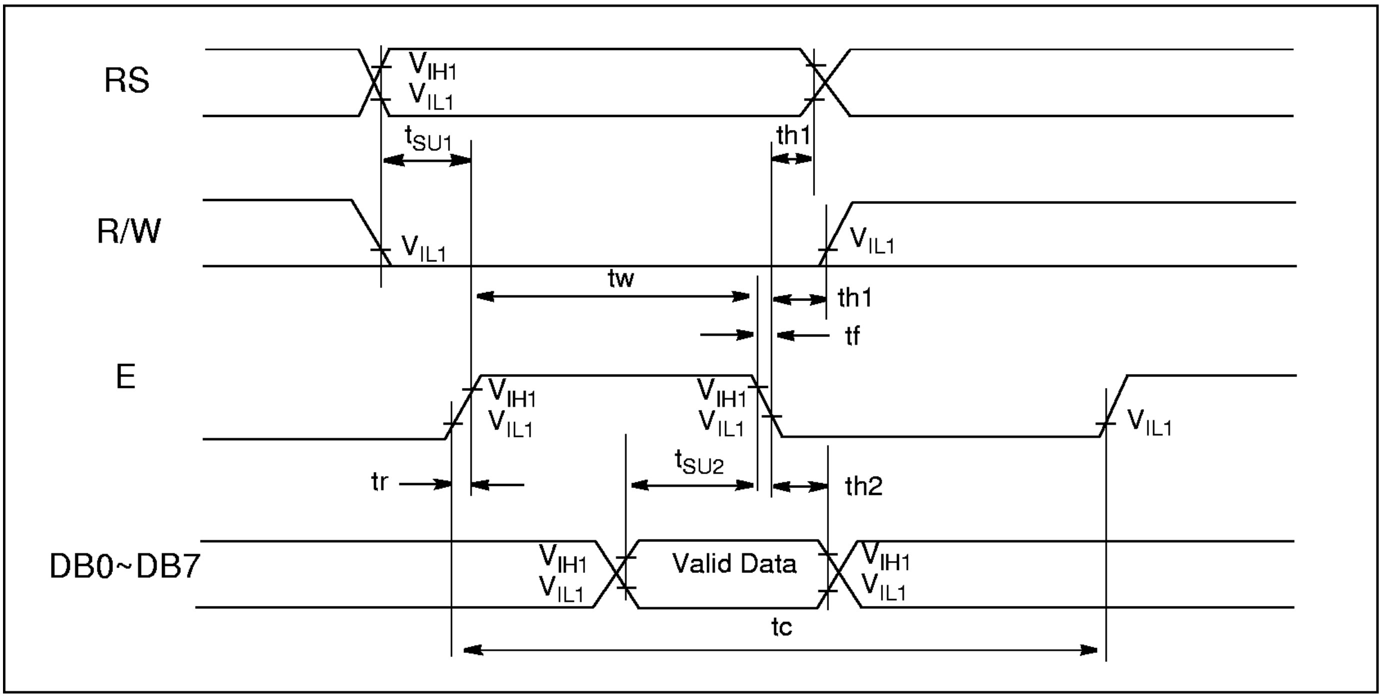


Figure 2: The bus timing diagram for write mode

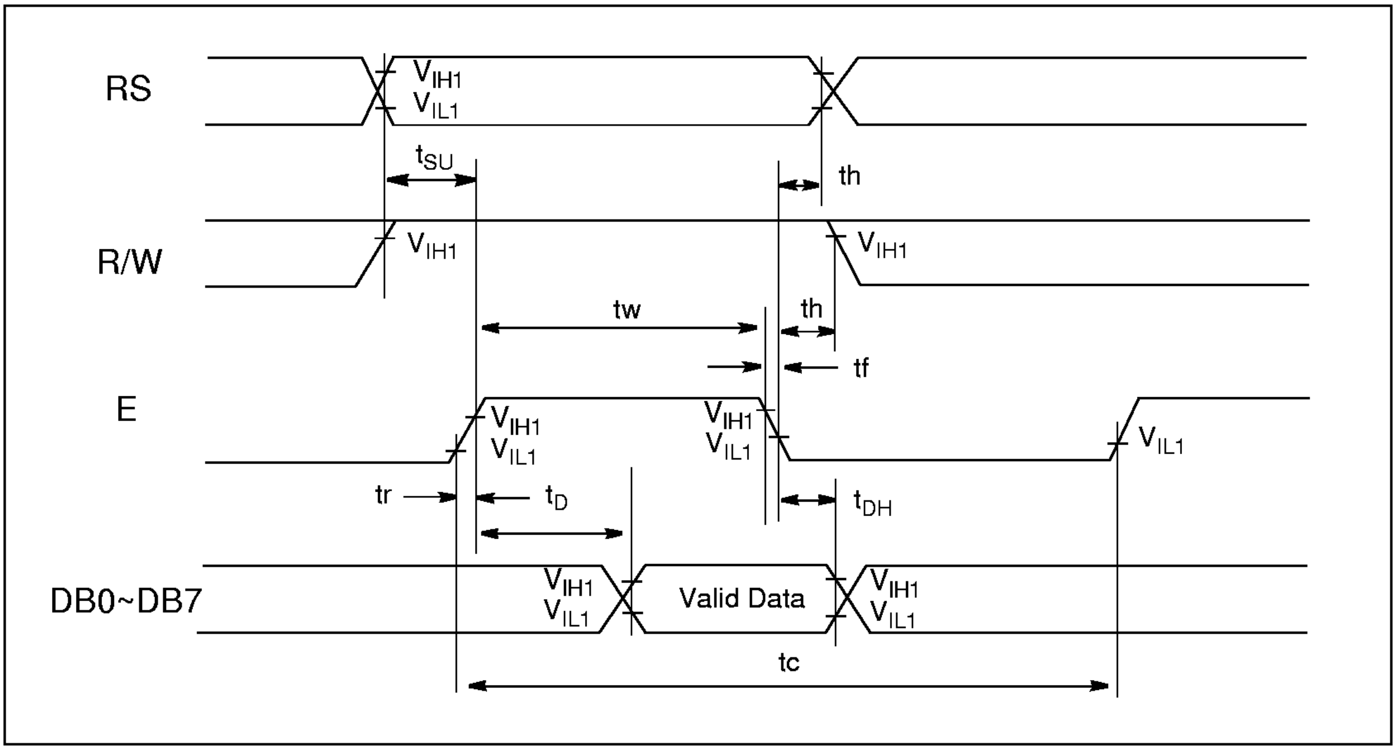


Figure 3: The bus timing diagram for read mode .

5.3 Timing Diagram of VDD against V0.

Power on sequence shall meet the requirement of Figure 4, the timing diagram of VDD against V0.

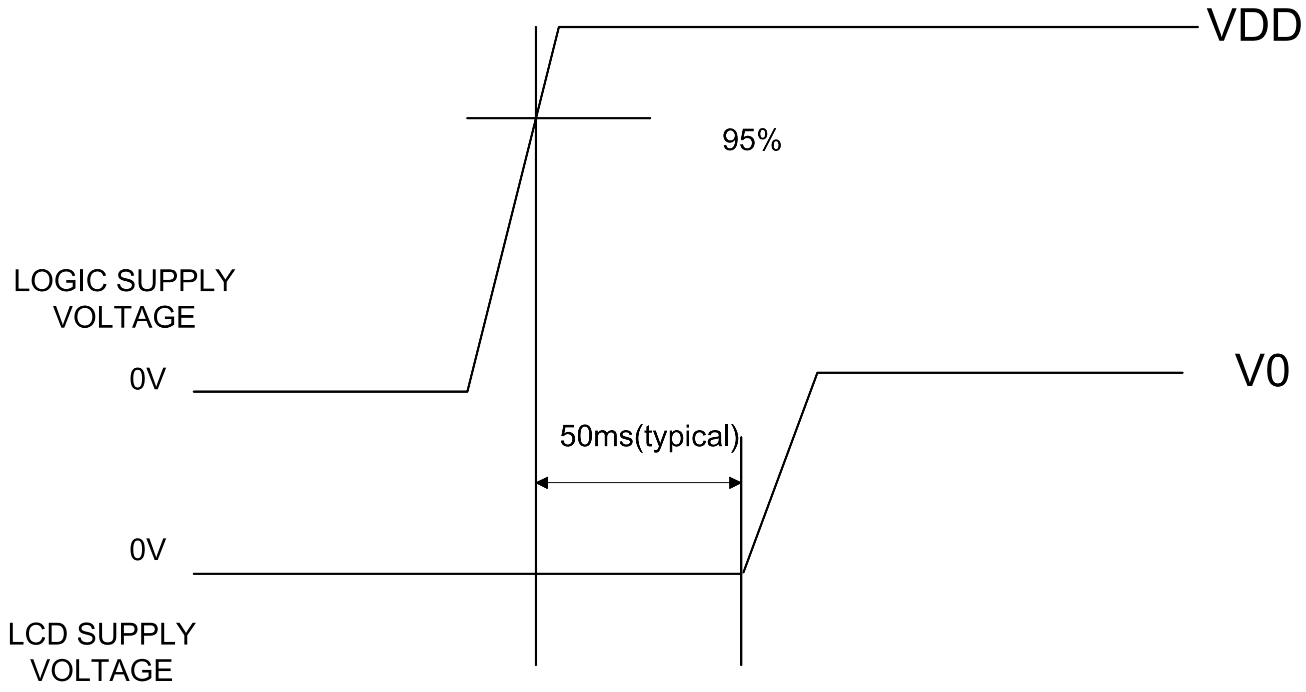
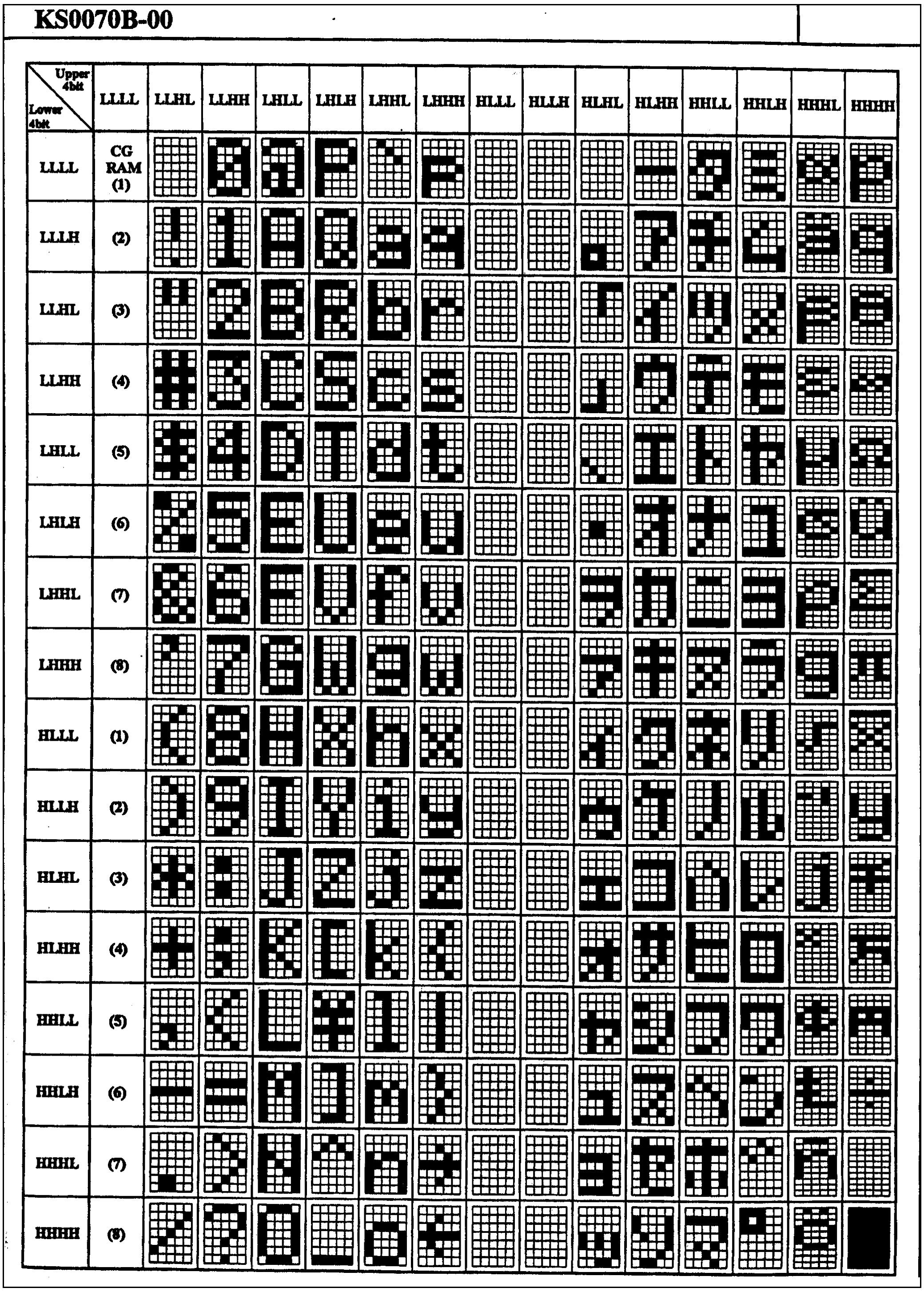


Figure 4: Timing diagram of VDD against V0.

6. CGROM Character Code Table



7. APPENDIX - LED Specification

1. 极限参数 ABSOLUTE MAXIMUM RATINGS

(除非特别说明,环境温度 Ta=25°C. Unless specified,The Ambient temperature Ta=25°C)

项目 Item	符号 Symbel	条件 Conditions	值 Rating	单位 Unit
* 极限直流正向电流 Absolute maximum forward current	Ifm		50	mA
* 脉冲驱动时极限正向电流 Peak forward current	Ifp	1 msec 脉冲,1/10占空比 1 msec Plus 10% Duty Cycle	120	mA
反向电压 Reverse Voltage	Vr		1.0	V
* 极限功耗 Power dissipation	Pd		150	mW
工作温度 Operating Temperature Range	Topr		−30~+70°C	°C
贮存温度 Storage Temperature Range	Tstg		−40~+80°C	°C

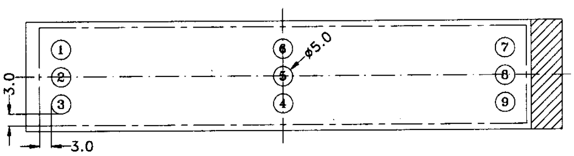
* 当工作温度高于25°C 时,Ifm、Ifp 和 Pd 必须降低;电流降低率是 −0.72 mA/°c(直流驱动),或 −1.72 mA/°c(脉冲驱动),功耗降低率是 −1.5 mW/°C.产品的工作电流不能大于对应工作温度条件 Ifm或Ifp的 60 %.
For operation above 25°C,The Ifm Ifp & Pd must be derated,the Curent derating is −0.72 mA/°c for DC drive and −1.72 mA/°c for Pulse drive,the Power dissipation is −1.5 mW/°c. The product working current must not more than the 60 % of the Ifm or Ifp according to the working temperature.

2. 电.光特性 ELECTRICAL−OPTICAL CHARACTERISTICS

(除非特别说明,环境温度 Ta=25°C. Unless specified,The Ambient temperature Ta=25°C)

项目 Item	符号 Symbol	最小值 min.	典型值 typ.	最大值 max.	单位 Unit	测定条件 Condition
正向电压 Forward Voltage	Vf	3.8	4.0	4.2	V	If= 40 mA
反向电流 Reverse Current	Ir		30		mA	Vr= 0.8 V
峰值波长 Peak wave length	λP				nm	If= 40 mA
频谱半宽度 Spectral Line Half width	Δλ				nm	If= 40 mA
* 亮度 Luminance	Lv	36	51		cd/m²	If= 40 mA

* 亮度值是 9个测量点的平均值,亮度最大值比最小值一般小于1.5(最大 2.0).
使用BM−7亮度色度仪测量, 测量光圈 ø 5 mm.
The luminance is the average value of 9 points, and The Lvmax./Lvmin. is less than 1.5 Typical (max 2.0). The measurement instrument is BM−7 luminance Colorimeter.The caperture is ø 5 mm.

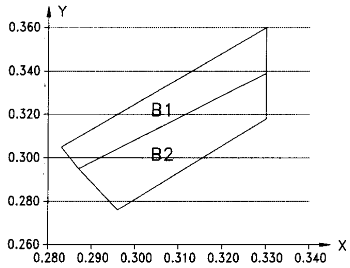


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色度坐标见下表:
Colour Coordinate see the chart:

	Rank B1 Limiting Region				Rank B2 Limiting Region			
X	0.287	0.283	0.330	0.330	0.296	0.287	0.330	0.330
Y	0.295	0.305	0.360	0.339	0.276	0.295	0.339	0.318

注: 色度坐标值公差±0.01
每批出货产品的色度坐标只能在B1区或只能在B2区.

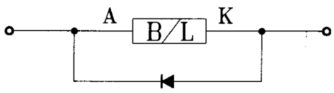


3. STATIC ELECTRICITY AND SURGE

* Static electricity and surge will damage the LEDs. It is recommended to use a wrist band or anti-electrostatic glove when handling the LEDs.
* All devices, equipment and machinery must be properly grounded.
* When inspecting own final products on which LEDs were mounted, it is recommended to check also whether the mounted LEDs are damaged by static electricity or not. It is easy to find static-dimaged LEDs by light emission test at lower current (below 1mA is recommended). Damaged LEDs will show some unusual characteristics such as leak current remarkably increases, starting forward voltage becomes lower, or the LEDs get unlighted at the low current.

4. RECOMMEND CONNECTION OF STATIC-ELECTRICITY RESISTANCE

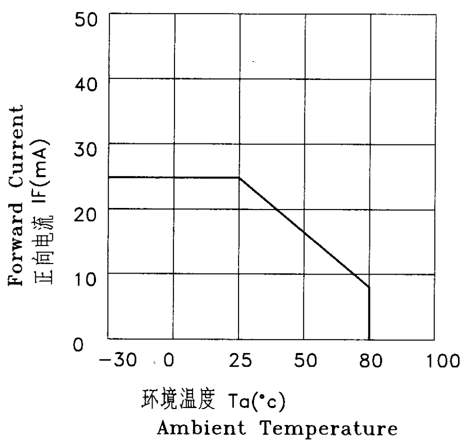
* This circuit diagram is a common ESD protection circuit for all super bright blue,white and green color LED backlight application.



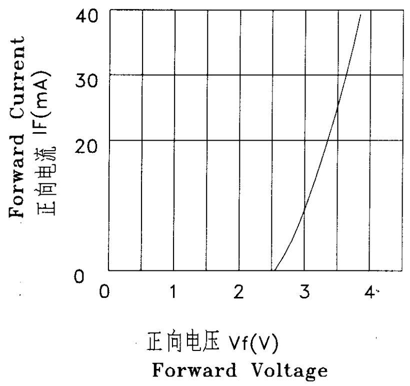
Protective Diode

5. LED ELECTRICAL CHARACTERISTICS

(1) 正向电流-周围温度
Forward Current VS. Ambient Temperrature



(2) 正向电流-正向电压特性
Forward Current VS. Forward Voltage



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